# Table of Contents

Grade 4 Vol.1
① Large Numbers
② Division
③ Thinking about How to Calculate
④ Angles
⑤ Division by One-digit Numbers
⑥ Quadrilaterals
⑦ Division by 2-digit Numbers
⑧ Line Graphs
⑨ Round Numbers
⑩ Japanese Abacus

## Numbers and Calculations

3rd grade
Addition and Subtraction
Multiplication (Rules, Vertical Form)
Division

4th grade Vol.1
Division (Rules, Vertical Form)

3rd grade
Decimal Numbers (Tenth place)

3rd grade
Fractions



## Measurement

1st grade
Comparing Sizes



## Data and Relations

3rd grade
Tables and Graphs

4th grade Vol.1
Line Graphs



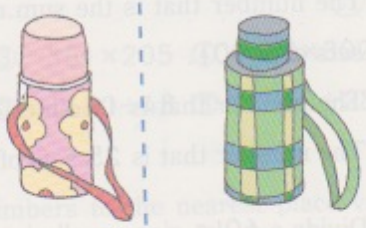


## Shapes and Figures

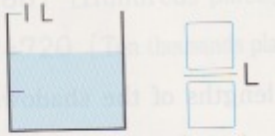
2nd grade
Shape of Boxes

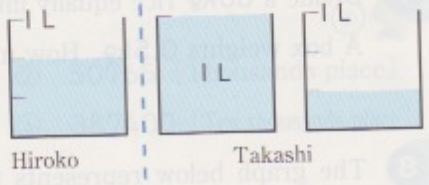
# 17 Fractions

▶▶ What are the amounts of water in Hiroko's bottle and Takashi's bottle in liters, respectively?

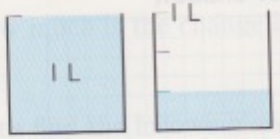


Hiroko

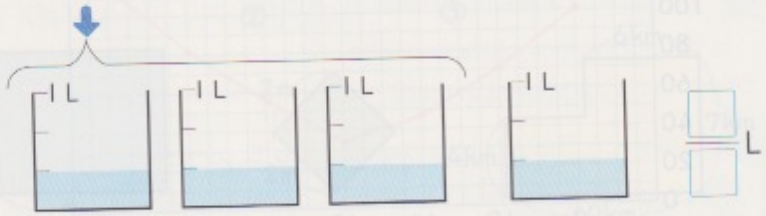


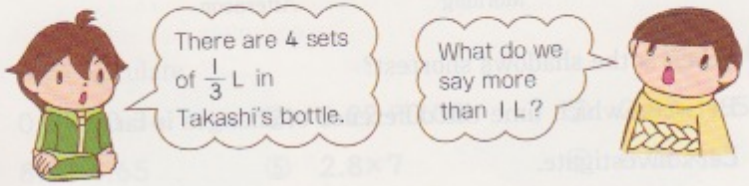




Takashi




1 L and $\frac{\square}{\square}$ L



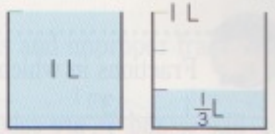




Let's think about how to represent fractions larger than 1 and how to calculate.



## 1 Fractions Larger than 1

**1** What is the amount of water in Takashi's bottle in liters?

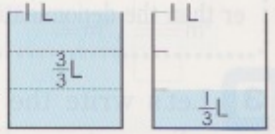



1 L and $\frac{\square}{\square}$ L ➡ 1 $\frac{\square}{\square}$ L

❶ 1 L and how many liters more?

❷ By looking at the figure on the right, how many $\frac{1}{3}$ L can we say?

$\frac{\square}{3}$ L

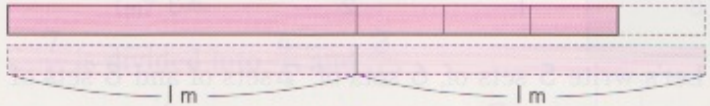



The sum of 1 L and $\frac{1}{3}$ L is written as $1\frac{1}{3}$ L and is read as "one and one third liters".

It is also written as $\frac{4}{3}$ L and is read as "four thirds liters".

$1\frac{1}{3} = \frac{4}{3}$

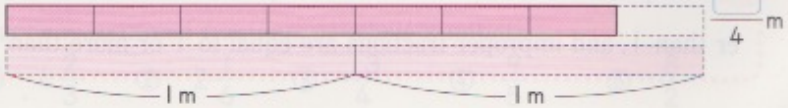
**2** How many meters is the length of the tape below?




❶ 1 m and how many meters more?

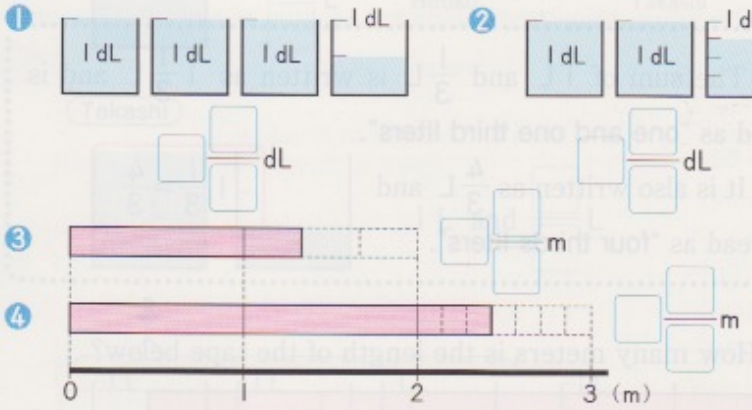
1 m and $\frac{\square}{\square}$ m ➡ 1 $\frac{\square}{\square}$ m

❷ By looking at the figure below, how many $\frac{1}{4}$ m are there in the tape?

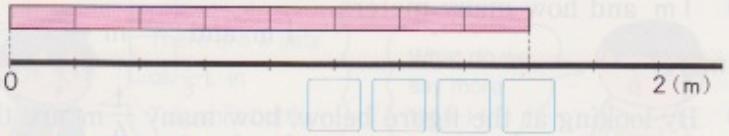


Fractions in which the numerator is smaller than the denominator, like $\frac{1}{3}$ and $\frac{3}{4}$, are called **proper fractions**. Fractions that are the sum of a whole number and a proper fraction, like $1\frac{1}{3}$ and $1\frac{3}{4}$, are called **mixed fractions**. Fractions in which the numerator is equal to or larger than the denominator, like $\frac{4}{4}$ and $\frac{7}{4}$, are called **improper fractions**.

**3** Let's write the following lengths and amounts of water as mixed fractions.



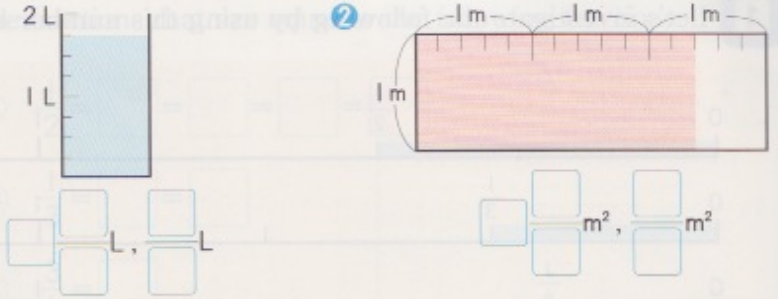

**4** Let's write 5 sets of, 6 sets of, 7 sets of and 8 sets of $\frac{1}{5}$ m as improper fractions, respectively.



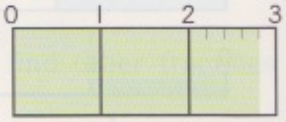

Proper fractions are smaller than 1, mixed fractions are larger than 1, and improper fractions are equal to 1 or more than 1.



**5** Let's write these fractions as mixed fractions and improper fractions.




**6** Let's change $2\frac{4}{5}$ to an improper fraction by marking on the figure on the right.

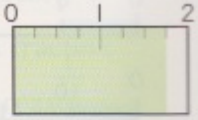



By looking at the fractions whose denominator is 5, $2\frac{4}{5}$ is $\frac{5}{5}$, $\frac{5}{5}$ and $\frac{4}{5}$.

If a unit is $\frac{1}{5}$, we get □ sets of $\frac{1}{5}$ by 5×2+4.

$2\frac{4}{5}=\frac{\square}{5}$

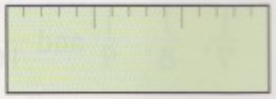
**7** Let's change $\frac{7}{4}$ to a mixed fraction.




$\frac{7}{4}$ is divided into $\frac{4}{4}$ and $\frac{3}{4}$.

Because $\frac{4}{4}$ is equal to 1, we get $\frac{7}{4}=\square\frac{\square}{4}$.

**8** Let's change $\frac{15}{5}$ to a whole number.



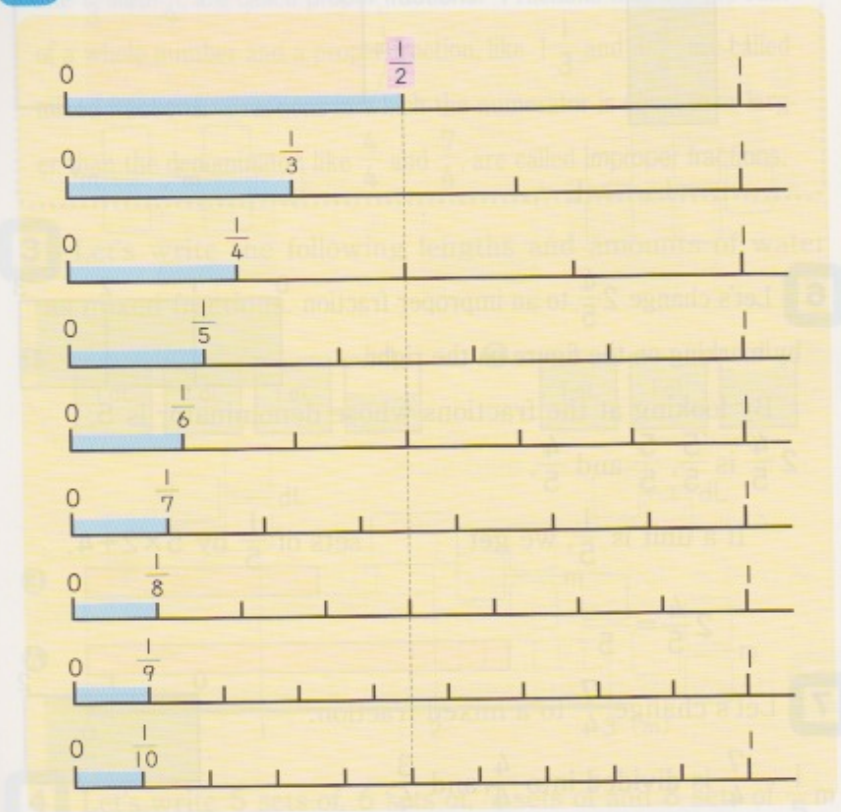
**Exercise**

Let's change mixed fractions to improper fractions, improper fractions to mixed fractions or whole numbers.

① $4\frac{2}{3}$ ② $2\frac{1}{6}$ ③ $\frac{13}{4}$ ④ $\frac{9}{5}$ ⑤ $\frac{8}{2}$

## 2 Equivalent Fractions

**1** Let's investigate the following by using this number line.




❶ Let's read out the following fractions $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{7}$, $\frac{1}{8}$, $\frac{1}{9}$ and $\frac{1}{10}$ from smallest to largest.

❷ Let's replace the numerators in ❶ with 2 and read them again from smallest to largest.

When the numerator is the same and the denominators becomes larger, its fraction becomes smaller.

❸ Let's look at the number line on the previous page, write the fractions that are equal to the following fractions.

Ⓐ $\frac{1}{2}=\square=\square=\square=\square$

Ⓑ $\frac{1}{3}=\square=\square$

Ⓒ $\frac{3}{4}=\square$

❹ Let's look at the number line and find other fractions that are equal to the fractions in ❸.

❺ Let's talk about what you have learned and summarize the results.

① When the denominators are the same, a fraction becomes larger as the numerator increases.

② When the numerators are the same, a fraction becomes smaller as the denominator increases.

③ Some fractions have the same value even though both their denominators and numerators are different.

**Exercise**

Which is larger? Let's fill the □ with equality or inequality signs.

① $\frac{3}{5}\square\frac{3}{8}$ ② $\frac{3}{7}\square\frac{5}{7}$ ③ $\frac{1}{2}\square\frac{4}{8}$

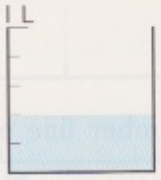
## 3 Addition and Subtraction of Fractions

### Addition of Fractions

**1** Akira and Yukie made coffee milk by mixing coffee and milk. How many liters did each one make?

❶ Akira

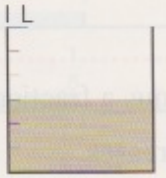

Coffee $\frac{1}{5}$ L



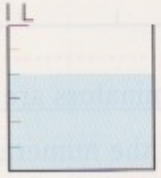

Milk $\frac{2}{5}$ L


$\frac{1}{5}+\frac{2}{5}=$ □

❷ Yukie



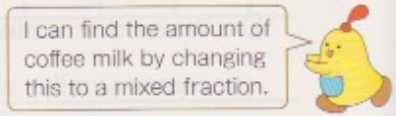

Coffee $\frac{3}{6}$ L




Milk $\frac{4}{6}$ L

$\frac{3}{6}+\frac{4}{6}=$ □

$=$ □ □




When adding fractions with the same denominators, add the numerators and keep the denominators unchanged.

**Exercise**

① $\frac{2}{4}+\frac{1}{4}$ ② $\frac{4}{7}+\frac{1}{7}$ ③ $\frac{2}{8}+\frac{3}{8}$

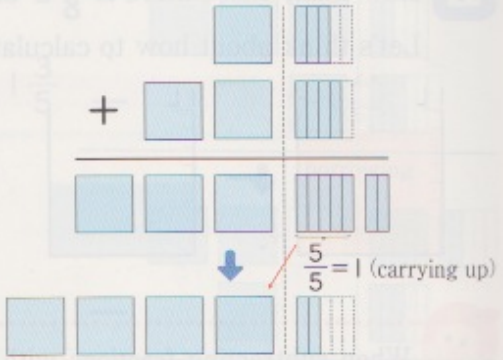
④ $\frac{2}{3}+\frac{2}{3}$ ⑤ $\frac{2}{5}+\frac{4}{5}$ ⑥ $\frac{3}{9}+\frac{6}{9}$



**2** Let's explain how to calculate $1\frac{3}{5}+2\frac{4}{5}$ by using the diagram.

$1\frac{3}{5}+2\frac{4}{5}=3\frac{7}{5}$

$=$ □




**3** Let's think about how to calculate $3\frac{4}{7}+\frac{3}{7}$.

When adding mixed fractions, add the sum of whole number parts and the sum of denominator parts. When the sum of denominator parts becomes improper fractions, carry up a whole number part.

**Exercise**

① $1\frac{1}{3}+2\frac{1}{3}$ ② $3\frac{2}{7}+1\frac{3}{7}$ ③ $4\frac{3}{8}+2\frac{4}{8}$

④ $2\frac{2}{6}+4\frac{3}{6}$ ⑤ $3\frac{1}{5}+5\frac{3}{5}$ ⑥ $3+3\frac{5}{6}$

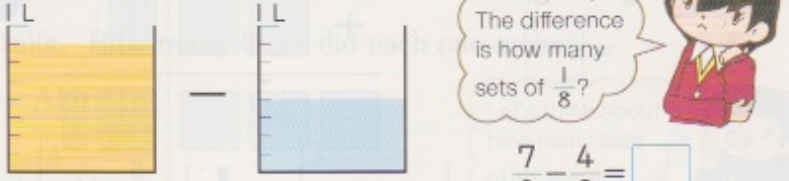
⑦ $1\frac{2}{3}+2\frac{2}{3}$ ⑧ $1\frac{5}{7}+1\frac{3}{7}$ ⑨ $2\frac{1}{5}+3\frac{4}{5}$

⑩ $2\frac{7}{9}+\frac{4}{9}$ ⑪ $\frac{2}{7}+4\frac{6}{7}$ ⑫ $\frac{1}{4}+2\frac{3}{4}$

## Subtraction of Fractions

**4** How many more liters is $\frac{7}{8}$ L of juice than $\frac{4}{8}$ L of milk?

Let's think about how to calculate the answer.

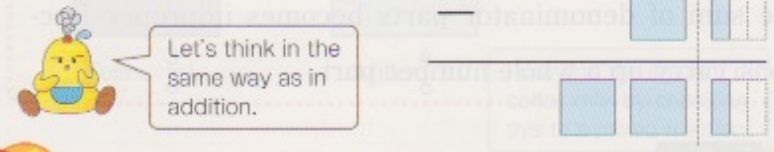



$$\frac{7}{8}-\frac{4}{8}=\square$$

When subtracting fractions with the same denominators, subtract the numerators and keep the denominator unchanged.

**5** Let's think about how to calculate $3\frac{2}{3}-1\frac{1}{3}$.

$$3\frac{2}{3}-1\frac{1}{3}=\square\frac{\square}{3}$$




When we can subtract mixed fractions, add the difference of whole number part and difference of numerators part.

Exercise

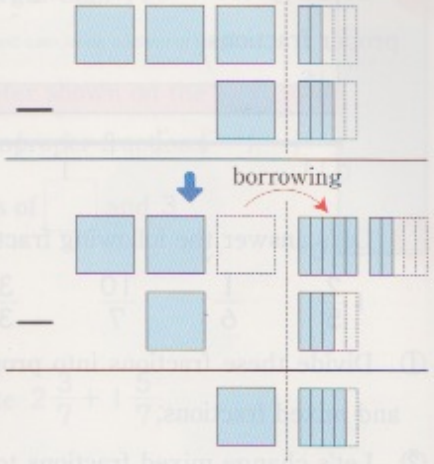
① $\frac{3}{4}-\frac{2}{4}$ ② $\frac{6}{7}-\frac{2}{7}$ ③ $\frac{10}{9}-\frac{8}{9}$

④ $6\frac{5}{7}-4\frac{3}{7}$ ⑤ $8\frac{2}{5}-5\frac{1}{5}$ ⑥ $7\frac{5}{9}-\frac{4}{9}$



**6** Let's explain how to calculate $3\frac{2}{5}-1\frac{3}{5}$ by using the diagram.

$$3\frac{2}{5}-1\frac{3}{5}=2\frac{\square}{5}-1\frac{3}{5}$$
$$=1\frac{\square}{5}$$




When subtraction of numerators cannot be done in subtraction of mixed fractions calculate by borrowing 1 from whole number part of the subtracted number.

**7** Let's think about how to calculate $3-1\frac{1}{4}$.

$$3-1\frac{1}{4}=2\frac{\square}{4}-1\frac{1}{4}$$
$$=1\frac{\square}{4}$$

Exercise

① $1\frac{2}{4}-\frac{3}{4}$ ② $1\frac{4}{9}-\frac{8}{9}$ ③ $1\frac{1}{6}-\frac{2}{6}$

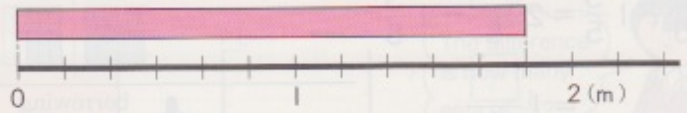
④ $6\frac{2}{7}-4\frac{5}{7}$ ⑤ $9\frac{3}{5}-3\frac{4}{5}$ ⑥ $7\frac{3}{8}-4\frac{7}{8}$

⑦ $1-\frac{1}{6}$ ⑧ $8-1\frac{2}{7}$ ⑨ $4-2\frac{1}{5}$

## Exercise

**1** Let's represent the following length as mixed fractions and improper fractions.

Pages 76~77




**2** Let's answer the following fractions.

Pages 76~77

$1\frac{2}{5}$　$\frac{1}{6}$　$\frac{10}{7}$　$\frac{3}{3}$　$2\frac{1}{8}$　$\frac{1}{2}$　$\frac{9}{8}$

① Divide these fractions into proper fractions, improper fractions and mixed fractions.

② Let's change mixed fractions to improper fractions, and change improper fractions to mixed fractions or whole numbers.

**3** Let's arrange the fractions in ( ) from largest to smallest.

Pages 78~79

① $\left(\frac{2}{7}, \frac{5}{7}, \frac{6}{7}, \frac{4}{7}\right)$　② $\left(\frac{1}{6}, \frac{1}{8}, \frac{1}{5}, \frac{1}{10}\right)$

③ $\left(2\frac{1}{8}, 2\frac{5}{8}, 2\frac{7}{8}, 2\frac{3}{8}\right)$　④ $\left(3\frac{2}{9}, 1\frac{5}{9}, 2\frac{7}{9}, 4\frac{1}{9}\right)$

**4** Let's calculate.

Pages 80~83

① $\frac{3}{5}+\frac{2}{5}$　② $2\frac{5}{9}+\frac{8}{9}$　③ $1\frac{2}{7}+2\frac{2}{7}$　④ $4\frac{2}{3}+2\frac{2}{3}$

⑤ $3\frac{4}{8}-1\frac{3}{8}$　⑥ $1\frac{5}{9}-\frac{7}{9}$　⑦ $1-\frac{7}{10}$　⑧ $4\frac{1}{5}-2\frac{3}{5}$

**5** Hiroko ran $1\frac{2}{5}$km on Sunday morning and $1\frac{4}{5}$km in the evening. How many kilometers did she run altogether?

And What is the difference in km?

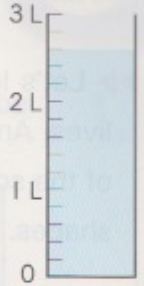
Pages 80~83



## Problems 1

**1** Let's summarize fractions larger than 1.

● Understanding the meaning of fractions and calculating addition of fractions.




① Represent the amount of water shown on the right as mixed fractions and improper fractions.

② About $2\frac{3}{7}$, 2 means 2 sets of ☐ and 3 means 3 sets of ☐.

③ $\frac{17}{7}$ means 17 sets of ☐.

④ Let's explain how to calculate $2\frac{3}{7}+1\frac{5}{7}$.

**2** Let's change improper fractions to mixed fractions, and change mixed fractions to improper fractions.

● Understanding the relationship between improper fractions and mixed fractions.

$\frac{7}{4}$　$\frac{11}{5}$　$\frac{7}{2}$　$2\frac{3}{4}$　$3\frac{5}{6}$　$4\frac{4}{9}$

**3** Let's calculate.　● Calculating addition and subtraction of fractions.

① $\frac{3}{4}+\frac{2}{4}$　② $2\frac{1}{3}+1\frac{1}{3}$　③ $2\frac{2}{7}+3\frac{5}{7}$　④ $1\frac{5}{8}+1\frac{6}{8}$

⑤ $\frac{11}{9}-\frac{4}{9}$　⑥ $3\frac{5}{6}-1\frac{4}{6}$　⑦ $5\frac{7}{15}-3\frac{7}{15}$　⑧ $4\frac{2}{7}-1\frac{3}{7}$

**4** Takuya's family drank $1\frac{3}{5}$L in yesterday morning and $\frac{4}{5}$L in evening.　● Understanding the situation and finding the answer.

① How many liters did they drink altogether?

② They drank $1\frac{2}{5}$L today. Which is the biggest amount of milk drank and by how many liters more?